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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ARTMAN, THOMAS R

ART UNIT PAPER NUMBER

2882

DATE MAILED: 06/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/836,029

Applicant(s)

BYERS ET AL.

Examiner

Thomas R Artman

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

The examiner acknowledges the declaration and therefore withdraws all rejections that rely upon the Miracky reference since it has been disqualified as prior art. The examiner also notes that the declaration also disqualifies as prior art the Sugama reference that was cited in the conclusion of the previous Office action.

However, previously cited art and new art precipitate the new grounds of rejection set forth below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 5, 7, 11, 12, 16, 17, 19, 21, 23 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Day (US 6,393,184).

Regarding claims 1 and 16, Day discloses optically-connected circuit boards and the method of connecting them, including:

1) first and second circuit boards (Fig.1, items 2 and 2') adjacent to each other,

Art Unit: 2882

- 2) a light source coupled to the first circuit board (item 4),
- 3) a photodetector coupled to the second circuit board (item 6'), and
- 4) the second circuit board is arranged with respect to the first board such that the photo detector receives the optical signals from the light source.

With respect to claims 3, 17 and 19, Day's device utilizes an optical transport medium, specifically light pipes (item 22).

With regards to claims 5 and 21, Day's light sources are laser diodes.

In regards to claims 7 and 23, Day's photodetectors are photodiodes.

With respect to claims 11 and 27, Day's mounting surfaces of both circuit boards are parallel.

With respect to claim 12, Day's circuit boards have additional light sources and photodetectors, and the circuit boards are arranged such that these pairs are optically coupled over other transport media.

Art Unit: 2882

Claims 1, 3-7, 11-12, 14, 16, 17, 19-23, and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoshimura (US 6,343,171).

Regarding claims 1 and 16, Yoshimura discloses optically-connected circuit boards and the method of connecting them, including:

- 1) first and second circuit boards (Fig.135) adjacent to one another,
- 2) a light source on one board and a photodetector on another board, and
- 3) the boards arranged such that the detector receives the light from the light source.

With respect to claims 3, 17 and 19, Yoshimura discloses the use of a light pipe (Fig.32) as the optical transport medium.

With regards to claims 4 and 20, Yoshimura has a ferrule (Fig.32, item 235) that is connected to the light pipe.

In regards to claim 14, the ferrule includes a physical well into which the light pipe is placed.

With respect to claims 5-6 and 21-22, Yoshimura's light sources are lasers, and more specifically, VCSELs.

With regards to claims 7 and 23, the photodetectors are photodiodes.

Art Unit: 2882

In regards to claims 11 and 27, the mounting surfaces of the circuit boards are parallel.

With respect to claim 12, Yoshimura discloses other pairs of light sources and photodetectors that communicate via other light pipes between circuit boards.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Day.

Regarding both claims, Day does not specifically disclose that his light pipes are made of plastic.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a cylindrical, plastic light pipe. Cylindrical plastic light pipes are easily formed and cheap due to being made of plastic. Their use is as common as indicator lights in computers. The power light and hard drive indicator light on the front of personal PC computer housings often use plastic, typically cylindrical, waveguides to channel the light from the LED on the circuit board to the holes cut into the front of the outer housing. The plastic waveguides are cheap, simple to manufacture, and are resilient to mechanical use, as in removing the outer housing for repairs, etc.

Art Unit: 2882

In the present application of using plastic light pipes for optically connecting mezzanine circuit boards to the main board, the circuit boards will be added to and removed from the main circuit board, perhaps several times for repairs, upgrades, etc., by technicians as well as individual owners of the hardware. These plastic waveguides, as opposed to glass for example, serve as a time-tested economical solution for the need of mechanically resilient waveguides.

Furthermore, it is known in the art that certain types of optical fibers are made, at least in part, from polymeric materials (plastics).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Day and in view of Husain (US 6,453,083).

Day does not specifically disclose light pipes that include lenses.

Husain discloses, in Figs. 9B and 10A, the use of lenses formed on the light pipe (in this case, an optical fiber) in order to properly focus the light into or out of the waveguide.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a lens to perform the desired function of properly coupling the optical signal from the light source to the light pipe. Lenses are ubiquitous in the art for optically coupling light between optical devices, an optical device and a waveguide, and between waveguides. Furthermore, the placement of the lens structure on the end of a waveguide allows for a simpler alignment, since the critical distance between the lens and the waveguide is already set by virtue of being formed on the end.

Art Unit: 2882

Claims 2 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Day and in view of Park (US 5,770,851).

Regarding both claims, Day does not utilize free space as the optical transport medium.

Park teaches the use of free space (Fig.5) as a simpler option since additional waveguides do not need to be fabricated and assembled.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to transmit light over free space since it is simpler to implement and is a well-known functional equivalent to the use of another optical medium, such as a waveguide.

Claims 10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Day and in view of Yoshimura.

Regarding both claims, Day does not teach the electrical interconnection between circuit boards.

Yoshimura teaches electrical interconnection between optoelectronic circuit boards (Fig.32, items 226, 228 and 232). The reference further states, in col.34, lines 30-42, that such connections allow for passing electrical signals, ground, and power to the board, as well as providing a structural connection between the boards.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have electrical interconnections between circuit boards in order to provide electrical power, ground and signals to the circuit board while providing structural support for stability.

Art Unit: 2882

Claims 8, 15 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura and in view of Jewell (US 6,421,474).

Regarding all three claims, Yoshimura does not disclose the use of lenses to focus the light from a light source or collect light for a photodetector.

Jewell discloses the use of a lens in order to focus light into and out of a waveguide (Fig.19). This provides improved coupling efficiency. In order to avoid optical losses, etc., in sensitive applications such as optical communication systems, lenses are commonly mated with laser diodes and photodetectors in order to collect and properly direct the optical signal for good coupling between devices and waveguides.

Claims 10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura.

Regarding both claims, Yoshimura teaches electrical interconnection between optoelectronic circuit boards (Fig.32, items 226, 228 and 232). The reference further states, in col.34, lines 30-42, that such connections allow for passing electrical signals, ground, and power to the board, as well as providing a structural connection between the boards.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have electrical interconnections between circuit boards in order to provide electrical power, ground and signals to the circuit board while providing structural support for stability.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Park also discloses the use of lenses in conjunction with VCSELs in order to improve the passage of the light through free space. Ouchi (US 6,477,286) teaches the use of photodiodes and VCSELs with corresponding electrical leads between optical devices. Okubora (US 5,357,122) teaches stacked circuit boards with photodiodes and VCSELs and optical windows for communication between them. Jewell (US 5,500,540) discloses stackable circuit boards with VCSELs and lenses for guiding the signals through free space.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R Artman whose telephone number is (703) 305-0203. The examiner can normally be reached on 8am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

Thomas R. Artman
Patent Examiner
June 13, 2003

